

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
5 December 2002 (05.12.2002)

PCT

(10) International Publication Number
WO 02/096641 A1

(51) International Patent Classification⁷: B32B 23/08,
27/08, 27/10, 17/04, 17/10

(21) International Application Number: PCT/US02/16704

(22) International Filing Date: 28 May 2002 (28.05.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/867,260 29 May 2001 (29.05.2001) US

(71) Applicant (for all designated States except US): OWENS
CORNING [US/US]; One Owens Corning Parkway,
Toledo, OH 43659 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): SNYDER, James, G.
[US/US]; 41 Callie Court, Granville, OH 43023 (US).

(74) Agents: BARNS, Stephen, W. et al.; Owens Corning Sci-
ence & Technology Center, 2790 Columbus Road, Building
54-1, Granville, OH 43023-1200 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG,
SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VN, YU, ZA, ZM, ZW.

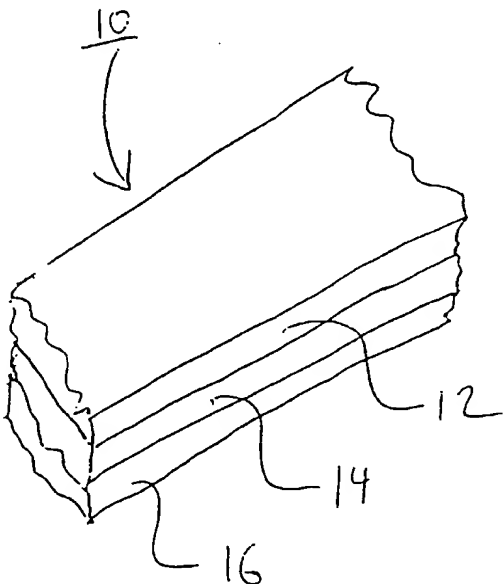
(84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR,
GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR,
NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the
claims and to be republished in the event of receipt of
amendments

For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: HIGH PERFORMANCE KRAFT FACING FOR FIBERGLASS INSULATION



(57) Abstract: A process for preparing a fiberglass insulation product, including the steps of: (a) providing a layer of kraft paper, (b) coating the kraft paper layer with from 2 to 10 pounds (0.91 to 4.54 kilograms) of HDPE or of polypropylene per 3000 square feet (278.7 square meters) of the paper to form an HDPE-kraft laminate or a polypropylene-kraft laminate, (c) coating the HDPE-kraft or polypropylene-kraft laminate with from 3 to 10 pounds (1.36 to 4.54 kilograms) of LDPE per 3000 square feet (278.7 square meters) of the HDPE-kraft laminate or polypropylene-kraft laminate to form an LDPE-HDPE-kraft laminate or an LDPE-polypropylene-kraft laminate, (d) adjusting the temperature of the LDPE-HDPE-kraft laminate or the LDPE-polypropylene-kraft laminate so that the LDPE becomes tacky while the HDPE or polypropylene remains solid, (e) providing a layer of fiberglass wool, and (f) contacting the LDPE layer of the LDPE-HDPE-kraft laminate or of the LDPE-polypropylene-kraft laminate with the fiberglass wool layer with pressure and cooling to bond the LDPE-HDPE-kraft laminate or LDPE-polypropylene-kraft laminate to the fiberglass wool layer to form a fiberglass insulation product.

WO 02/096641 A1

fastened in position for insulating purposes, and to minimize dusting of the fiberglass fibers within the insulation product. In most instances, the provision of a facing that forms a vapor barrier is desirable in order to prevent water vapor passing through the insulation product and condensing on a cold surface.

5 Facing materials may be adhered to the fiberglass fiber blanket in a number of ways. For example, solvent-based or water-based adhesives or hot-melt adhesives may be applied to the facing material or to the surface of the fiberglass wool blanket, with the fiberglass wool blanket and the facing material then being brought together to surface bond the two materials. Alternatively, the facing material itself may be rendered adhesive
10 before application to the fiberglass wool blanket. For example, a thermoplastic material such as a synthetic polymer or a bituminous layer on one surface of the facing material may be heat softened for that purpose. However, the heat treatment of polyethylene – the most commonly used synthetic polymer in this context – may destroy any water vapor barrier properties it possesses.

15 A product which has met with some commercial success is a kraft paper/polyethylene vapor barrier manufactured by Owens Corning, which is bonded via the polyethylene to a glass wool blanket. A more sophisticated product consists of an aluminum foil/kraft paper vapor barrier adhesively bonded on its kraft paper surface to a glass wool blanket. However, the aluminum foil incorporated as the vapor barrier renders
20 it much more expensive.

 The organization known as ASTM has published – under the designation E 96-00 (published July 2000) – a description of test methods to determine water vapor transmission of materials through which the passage of water vapor may be of importance, such as paper and other sheet materials. Those test methods permit the determination of
25 PERM values for the sheet materials. The PERM values reflect the water vapor transmission and permeance of the materials.

 Many conventional insulation facing products fail to consistently meet PERM requirements. PERM values greater than 1.0 are considered to be unacceptable for the purposes of the present invention.

30 SUMMARY OF THE INVENTION

 The present invention provides a kraft facing for fiberglass insulation that consistently meets PERM requirements.

within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

5 The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus do not limit the present invention.

Figure 1 is a perspective view (not to scale) illustrating a facing sheet in accordance with the present invention.

10 Figure 2 is a perspective view (not to scale) illustrating an insulation product in accordance with the present invention.

DETAILED DESCRIPTION AND PREFERRED EMBODIMENTS OF THE INVENTION

15 As illustrated in Figure 1, impermeable facing material 10 of this invention may comprise a kraft paper layer 12, a high density polyethylene layer 14, and a low density polyethylene layer 16. As illustrated in Figure 2, insulation product 20 of this invention may comprise an impermeable facing material layer 10 (where layer 10 comprises kraft paper, HDPE, and LDPE), a fiberglass wool layer 25, and a permeable kraft paper layer 27.

KRAFT PAPER

25 The paper component in the present invention is preferably kraft paper because of its ready availability and low cost, its inherent strength and durability, and its ability to be readily laminated to the preferred polyethylene films. The kraft paper suitably has a thickness corresponding to a weight of 30 to 50 lbs/3000 ft² (13.6 to 22.7 kg/278.7 m²), preferably 35 to 40 lbs/3000 ft² (15.9 to 18.1 kg/278.7 m²). However, other types of paper such as recycled paper or calendered paper may be used, especially where particular properties, such as visual appearance or susceptibility to the application of other products, 30 such as printing, may be desired. Of course, kraft paper is itself susceptible to printing, for example in order to carry product information.

THE INSULATION PRODUCT

In a preferred aspect of the invention, low density polyethylene is applied to the high density polyethylene face of a kraft paper/HDPE laminate, which is then heated to a temperature of 90°C (194°F) to 150°C (302°F), for example approximately 110°C

(230°F). This elevated temperature serves to soften the low density polyethylene, thereby rendering the LDPE more susceptible to direct bonding with the fibers of the fiberglass wool blanket. This heating step may be carried out by subjecting the coated facing to radiant heat, for example by conveying it past an infrared heater, or by passing it over a heated roller, for example an oil filled roller, or by any combination of these.

Following application of the LDPE to the facing material and following any optional heating step, the facing material is applied to the fiberglass wool blanket. The assembled facing/fiberglass wool blanket is then compressed to ensure adhesion of the fiberglass wool blanket to the facing material and to force a portion of the LDPE into the thickness of the fiberglass wool blanket. In this manner, adhesion of the facing to the glass wool becomes more than just a surface contact phenomenon and a far stronger and more durable insulation product is formed.

The degree of compression to which the assembly of fiberglass wool blanket and facing material is subjected for enhancing adhesion will depend upon the density and compressibility of the fiberglass wool blanket and the degree of LDPE penetration required relative to the amount of LDPE applied. In this respect, since a fibrous glass blanket containing binder generally has a greater fiber density at its surface than in its interior as a result of its loft being set in the binder curing oven, some compression of the blanket will be necessary in most cases to force the LDPE through the more dense surface layer of fiber towards the interior of the blanket for good bonding. Generally, all that will be required to provide satisfactory enhancement of adhesion is to compress the assembly to approximately 50 to 95% of its uncompressed thickness. Such compression can be applied between an upper roller and a lower roller or conveyor surface. Alternatively, it can be provided by passing the assembly of fiberglass wool blanket and facing material under tension around a roller surface. Clearly, it is not required or desired to retain the fiberglass wool blanket in a compressed state for any significant period of time since it is undesirable for the LDPE to dry or cure while the blanket is in a compressed state. Indeed, all that is required is that the LDPE should be forced to penetrate into the

variations due to temperature or barometric pressure or both. One test specimen was placed in each of the four test dishes such that the edge of the test specimen rested on the recessed lip. A specimen centering ear template was positioned on each test specimen such that it was centrally located. Hot wax was applied to the test specimen area that was exposed around the outside edge of the specimen centering ear template. Once the wax was cooled, the specimen centering ear template was removed. The test dish assemblies were then placed into reclosable poly bags or a desiccator while awaiting weighing. The test dish assemblies were then each weighed to the nearest 0.0001 gram. The test dish assemblies were then placed into a test chamber operating at 23°C (73.4°F) $\pm 0.6^{\circ}\text{C}$ (33.1°F). The date, time (to the nearest 5 minutes), temperature (to the nearest 0.1°C (32.2°F)), relative humidity (to 0.5%), and barometric pressure (to nearest 0.1 kPa) were recorded. Each test dish assembly was weighed daily until a constant weight gain was attained. A constant weight gain occurs when the differences between successive weighings are within 1%.

First the rate of water vapor transmission (G/t) was calculated, using a mathematical least squares regression analysis of the weight change (modified by the weight change of the dummy specimen) as a function of time, in grams/h. Then the water vapor transmission for individual specimens was calculated using the equation $\text{WVT} = (\text{G/t})/\text{A}$ where WVT is water vapor transmission rate, $\text{g/h}\cdot\text{m}^2$, G is weight change in grams, t is time during which the weight gain occurred in hours, and A is the test area (test dish mouth area) in square meters.

The results for the three specimens were 0.3727, 0.4410, and 0.3932, for an average of 0.4023, well under the target maximum of 1.0.

Example 2

A layer of kraft paper weighing 40 pounds (18.1 kilograms) per ream was coated with HDPE at a rate of 5 pounds (2.27 kilograms) per ream of said paper to form an HDPE-kraft laminate. The HDPE-kraft laminate was coated with LDPE at a rate of 4 pounds (1.8 kilograms) per ream of said HDPE-kraft laminate to form an LDPE-HDPE-kraft laminate. The temperature of the LDPE-HDPE-kraft laminate was adjusted so that the LDPE became tacky while the HDPE remained solid. A layer of fiberglass wool was provided. The LDPE layer of the LDPE-HDPE-kraft laminate was contacted with the

contacted with a fibrous glass blanket having a width of 1.2 m, a thickness of 280 mm, and a density of approximately 11.0 kg/m^3 . The resulting insulation assembly is immediately compressed against the heating roll by a roller to a thickness of 210 mm.

5 20 m downline of the roller, the resulting insulation assembly is chopped in the transverse direction by a blade into lengths of insulation material having a size of 1.2 m by 5.5 m. The 5.5 m lengths of insulation product are immediately rolled and compressed to a thickness of 30 mm and packaged for storage and transportation.

10 The insulation material produced as described above has a robust structure which is resistant to repeated handling, and the facing cannot be separated from the fibrous glass blanket without destroying the whole structure of the material.

(f) contacting the low melting point polymer layer of the low melting point polymer-high melting point polymer-kraft laminate with the fiberglass wool layer with pressure and cooling to bond said low melting point polymer-high melting point polymer-kraft laminate to said fiberglass wool layer to form a fiberglass insulation product.

5 9. The process of claim 8 wherein said high melting point polymer is high density polyethylene (HDPE) or polypropylene.

 10. The process of claim 9 wherein said low melting point polymer is low density polyethylene (LPDE).

 11. The process of claim 10 which comprises the steps of:

10 (b) coating the kraft paper layer with from 2 to 10 pounds (0.91 to 4.54 kilograms) of HDPE or of polypropylene per 3000 square feet (278.7 square meters) of said paper to form the HDPE-kraft laminate or polypropylene-kraft laminate, and

 (c) coating the HDPE-kraft laminate or polypropylene-kraft laminate with from 3 to 10 pounds (1.36 to 4.54 kilograms) of LDPE per 3000 square feet (278.7 square meters) of said HDPE-kraft laminate or polypropylene-kraft laminate to form the LDPE-HDPE-kraft laminate or LDPE-polypropylene-kraft laminate.

15 12. The process of claim 8 wherein the temperature is adjusted with an infrared heater, a microwave heater, or a rotating hot roll.

20 13. A fiberglass insulation product comprising a layer of fiberglass wool and a flexible planar laminate comprising an external support layer of kraft paper to which is adhered a central vapor barrier layer of high melting point polymer to which is adhered an internal adhesive layer of low melting point polymer.

 14. The fiberglass insulation product of claim 13 wherein the high melting point polymer is high density polyethylene (HDPE) or polypropylene.

25 15. The fiberglass insulation product of claim 14 wherein the low melting point polymer is low density polyethylene (LPDE).

30 16. The fiberglass insulation product of claim 15 in which the flexible planar laminate comprises from 2 to 10 pounds (0.91 to 4.54 kilograms) of HDPE and from 3 to 10 pounds (1.36 to 4.54 kilograms) of LDPE per 3000 square feet (278.7 square meters) of kraft paper having a weight of 30 to 50 lbs/ft² (146 to 244 kg/m²).

 17. The fiberglass insulation product of claim 14 in which the flexible planar laminate comprises 7 pounds (3.18 kilograms) of HDPE and 5 pounds (2.27 kilograms) of LDPE per 3000 square feet (278.7 square meters) of kraft paper.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/16704

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B32B23/08 B32B27/08 B32B27/10 B32B17/04 B32B17/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 701 359 A (AKAO MUTSUO) 20 October 1987 (1987-10-20) claims; figures 8,14; examples 4,8-11,15 ---	1-3
X	US 5 804 020 A (AKAO MUTSUO ET AL) 8 September 1998 (1998-09-08) claims; figure 12; examples 7-9 column 9, line 53-65 column 14, line 52 -column 15, line 9 column 16, line 23-25 ---	1
A	US 5 746 854 A (SYME ROBERT W ET AL) 5 May 1998 (1998-05-05) claims 1-3 column 4, line 5-53 column 4, line 43-46 column 5, line 64 -column 6, line 61 column 7, line 34-44 --- -/--	8-17

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

16 September 2002

Date of mailing of the international search report

24/09/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Seiberlich, P

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/16704

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4701359	A	20-10-1987	JP 1985940 C	08-11-1995
			JP 6095201 B	24-11-1994
			JP 61179738 A	12-08-1986
			JP 61189936 A	23-08-1986
US 5804020	A	08-09-1998	JP 3109751 B2	20-11-2000
			JP 4372396 A	25-12-1992
			DE 69221217 D1	04-09-1997
			DE 69221217 T2	27-11-1997
			EP 0519251 A2	23-12-1992
			JP 2627591 B2	09-07-1997
			JP 5050568 A	02-03-1993
			US 5358785 A	25-10-1994
			JP 2799796 B2	21-09-1998
			JP 5045803 A	26-02-1993
US 5746854	A	05-05-1998	CA 2211309 A1	22-01-1998
			US 6135747 A	24-10-2000
			US 5900298 A	04-05-1999
			US 5879615 A	09-03-1999
WO 9963175	A	09-12-1999	AU 3892299 A	20-12-1999
			EP 1084309 A1	21-03-2001
			WO 9963175 A1	09-12-1999
			US 6191057 B1	20-02-2001